

PFAS ASSESSMENT AND MITIGATION



COMPREHENSIVE SUPPORT FOR MANAGEMENT OF PFAS-CONTAMINATED SITES

From the field to the lab, Battelle is leading the way in development of new solutions for emerging environmental problems—like per- and polyfluoroalkyl substances (PFAS). If you have a PFAS challenge to solve, we can support you every step of the way, from initial site assessment and characterization to stakeholder communication.

At Battelle, we bring together all the expertise you need under one roof—including analytical chemistry, environmental science, toxicology and data analytics. We understand PFAS chemistry, fate and transport and have extensive experience in sampling, handling and analyzing these challenging compounds. This enables us to go beyond standard methods and develop new approaches to characterizing and mitigating PFAS contamination in even the most challenging environments.

OUR SERVICES

Field Sampling for Site Assessment, Characterization and Monitoring

Battelle can help you accurately measure and understand the extent and severity of your PFAS contamination. We developed a standard operating procedure for the sampling and handling of PFAS, which is currently being followed at Navy bases for characterization activities. Our field team will work with you to develop a cost-effective sampling plan tailored to the characteristics of your site and the questions you need to answer. We offer:

- State-of-the-art sampling methods for low-level detection, high-resolution site characterization, source zone characterization and analysis of comingled contaminant plumes
- New method development for low-level PFAS detection, including passive sampling technologies
- Long-term monitoring strategies
- Modeling and 3-D visualization tools to help you understand the nature, extent, fate and transport of contaminants on your site and analyze exposure scenarios

Analytical Lab Services

Our analytical lab in Norwell, Massachusetts, uses validated methods that are based on EPA Method 537.1 and is accredited for PFAS detection in soil, sediment, tissues and water according to DoD QSM version 5.1. We apply rigorous quality controls to accurately measure even trace levels of PFAS compounds in sediments, soils, water and biological tissues. Our lab provides:

- High-quality, defensible data with very low detection limits (parts per trillion range for waters and low parts per billion range for soils and sediments)
- New method development and optimization

Remedy Selection and Optimization

Battelle is conducting research and development to define remediation strategies for PFAS compounds. We can apply the knowledge gained in our research to help you design approaches for your PFAS problem and research remediation methods. Our services include:

- Feasibility studies to evaluate the cost and effectiveness of different remediation options based on site characteristics, contaminant levels and cleanup goals
- New remedy development, selection and design

Risk Assessment

At Battelle, we don't just give you data—we help you understand it and communicate with your stakeholders. We use advanced analytical methods grounded in the latest research on PFAS impacts to give you an accurate, objective evaluation of human health and ecological risks. We can also provide support for publications and public meetings to address stakeholder concerns.

Environmental Toxicology

Battelle provides industry-leading environmental toxicology services, including general, developmental and reproductive, neurobehavioral, cardiopulmonary and inhalation. We can design and conduct toxicology studies to help the industry better understand the toxic effects and exposure risks of PFAS compounds. Our toxicology team provides clear, defensible data for environmental impact studies and analysis of human health impacts.

OUR EXPERIENCE

Remedial Investigation of Groundwater at NAWC Warminster

Battelle is assisting the Navy in managing the former NAWC Warminster site, where groundwater is a source of drinking water and is contaminated with PFOA and PFOS above lifetime health advisory values. Battelle has designed an approach for conducting a remedial investigation (RI) of PFAS at the site that includes installation of groundwater monitoring wells, collection of groundwater samples from new and existing monitoring wells, collection of soil samples from previously identified potential PFAS source areas, collection of sediment and surface water samples from retention ponds and streams, and residential wells. In addition, Battelle has assisted the Navy with public outreach on PFAS. In May 2015, the EPA regulatory team working with the Navy at the Warminster site received an internal award from EPA OSWER HQ ("National Notable Award") for quick collaborative investigation and action to protect residents of Warminster, Pa. from PFAS-contaminated drinking water.

Development of Passive Sampling Technologies for PFAS

Battelle currently is working on a development of a PFAS passive sampler. A variety of sorbent materials are being tested for their ability to sorb the PFAS from water. Simultaneously, a variety of solvents are being investigated to develop efficient extraction procedures. The passive sampler could be used for sediment pore water sampling, surface water sampling and groundwater sampling. The sampler will be incorporated into a vibrating device to allow significant reduction in equilibration times achieved through disruption of diffusive boundary layer in water or depletion layer in sediment. Use of a passive sampler reduces potential for PFAS contamination or loss to/from sampling equipment, and provides more accurate results by avoiding detection of only temporary spikes in PFAS concentrations.

Studying Fate and Transport of PFAS at a Navy Site

Battelle is conducting a multi-media sampling at a Navy site to evaluate the sources and fate and transport of PFAS. The media that will be sampled include rainwater, soil, surface water, groundwater and fish tissue. Samples

will be collected from both background and source areas and analyzed for 18 PFAS compounds to speciate and determine the distribution of PFAS in different media. This information will assist in determining the fate and transport of PFAS as well as attenuation processes that may affect PFAS migration.

Ecological Risk Assessment Using a Weight of Evidence (WOE) Approach

Battelle has adapted a weight of evidence (WOE) approach utilized by U.S. EPA to bridge the gap of ecological assessment of PFAS. Toxicity data for environmental receptors exists, but these data are limited to a select handful of PFAS. Inferences can be made on the toxicity, fate and transport of PFAS from surrogate PFAS based on similar structural and environmental fate properties. Battelle uses a WOE approach to make these inferences. The WOE approach is applicable for both ecological and human health assessments.

Solidification and Stabilization of PFAS in Soils

Battelle performed a thorough literature review of sorption technologies and research conducted to stabilize PFAS in source area soils. A summary documenting the findings was prepared for U.S. EPA. Battelle subsequently prepared a Quality Assurance Project Plan (QAPP) to conduct laboratory studies to test the best available sorbents on soil contaminated with PFAS. This laboratory study will test both commercially available and a newly designed sorbent's capability to solidify and stabilize PFAS in source zone soils.

Oxidation of Perfluorinated Compounds by High Valence Iron

Battelle has been researching an oxidation technology for the removal of PFAS from contaminated groundwater by using high-valent iron-based oxidants (known as ferrates) to treat PFOS and PFOA in water. Transformation of PFOS and PFOA has been observed with just one ferrate application. High-valent iron-based oxidants treat perfluorooctanesulfonate and perfluorooctanoic acid in water. Battelle is currently partnering with a team to further this method.

Every day, the people of Battelle apply science and technology to solving what matters most. At major technology centers and national laboratories around the world, Battelle conducts research and development, designs and manufactures products, and delivers critical services for government and commercial customers. Headquartered in Columbus, Ohio since its founding in 1929, Battelle serves the national security, health and life sciences, and energy and environmental industries. For more information, visit www.battelle.org.

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